(b) measuring the fracture toughness of said paper/paperboard product;

(c) determining that the measured fracture toughness of said paper/paperboard product is different than a desired fracture toughness;

(d) determining a second set of respective values for said plurality of material properties that will produce a fracture toughness closer to said desired fracture toughness than was said measured fracture toughness; and

(e) manufacturing paper/paperboard product of said particular grade having respective values for said plurality of material properties that are respectively substantially equal to said first set of respective values,

wherein said measuring step comprises determining the essential work of fracture, said step of determining a second set of respective values for said group of material properties is performed using a mathematical model of fracture toughness as a function of said plurality of material properties, and said plurality of material properties comprise filler level, softwood pulp content and caliper.

18. (Amended) A method for operating a paper mill, comprising the following steps:

manufacturing different grades of paper or paperboard;

measuring the fracture toughness of test samples of paper or paperboard taken from multiple production runs;

for each of a multiplicity of production runs, storing fracture toughness measurements and associated material property data in a databank;

<u>retrieving from said databank a set of material property data for a grade of paper or paperboard; and</u>

<u>manufacturing a grade of paper or paperboard product having material properties that are respectively substantially equal to values in said material property data retrieved from said databank,</u>

[The method as recited in claim 17,] wherein each set of material property data comprises respective data for caliper, softwood pulp content and filler level of a respective grade of paper or paperboard.

21. (Amended) <u>A method for designing a grade of paper or paperboard, comprising the following steps:</u>

<u>performing a factorial experiment to investigate the effects of papermaking variables on in-plane fracture toughness of a grade of paper or paperboard;</u>

<u>analyzing data acquired by said factorial experiment to derive a statistically significant mathematical model for fracture toughness as a function of a plurality of material properties of said grade of paper or paperboard; and</u>

<u>selecting a desired fracture toughness for a grade of paper or paperboard to be manufactured and determining values for said plurality of material properties which, when input to said mathematical model, produce a calculated fracture toughness approximately equal to said desired fracture toughness,</u>

[The method as recited in claim 19,] wherein said plurality of material properties comprise caliper, softwood pulp content and filler level.

22. (Amended) The method as recited in claim [20] <u>21</u>, further comprising the steps of:

manufacturing a plurality of paper or paperboard products of a particular grade, each product having a different fracture toughness;

converting said products in a printing press;

acquiring data reflecting the press runnability performance of each of said products in said printing press; and

determining an optimal range of fracture toughness based on acquired press runnability performance data,

wherein said desired fracture toughness is selected from said optimal range of fracture toughness.

23. (Amended) The method as recited in claim [20] <u>21</u>, further comprising the step of manufacturing a paper or paperboard product having the material properties that were input to said mathematical model.

24. (Amended) The method as recited in claim [20] <u>21</u>, wherein said mathematical model of fracture toughness is of the form:

$$FT = \beta_0 - \beta_1 x_1 + \beta_2 x_2 + \beta_3 z_2$$

where x_1 is a function of filler level, x_2 is a function of softwood pulp content, z_2 is a function of caliper, and β_0 through β_3 are constants.

Also, please add the following claims:

25. A method for making paper/paperboard, comprising the following steps:

(a) conducting a factorial experiment to investigate the effects of papermaking variables on in-plane fracture

toughness of paper/paperboard;

(b) determining a functional relationship between a plurality of material properties of paper/paperboard from data acquired during said factorial experiment, one of said material properties being fracture toughness;

(c) manufacturing a first paper/paperboard product for which said material properties other than fracture toughness have a first set of respective selected values;

(d) measuring the fracture toughness of said first paper/paperboard product;

(e) determining a deviation of said measured fracture toughness from a desired fracture toughness;

(f) determining a second set of respective selected values of said material properties other than fracture toughness that are calculated to produce a product having a fracture toughness closer than said measured fracture toughness to said desired fracture toughness, said second set of respective selected values being derived by applying said functional relationship to said first set of respective selected values and said deviation; and

(g) manufacturing a second paper/paperboard product for which said material properties other than fracture toughness have said second set of respective selected values,

wherein material properties comprise filler level, softwood pulp content and caliper.

26. The method as recited in claim 25, wherein said functional relationship is of the form:

$$FT = \beta_0 - \beta_1 x_1 + \beta_2 x_2 + \beta_3 z_2$$

where x_1 is a function of filler level, x_2 is a function of softwood pulp content, z_2 is a function of caliper, and β_0 through β_3 are constants.

27. A method for making paper/paperboard, comprising the following steps:

(a) formulating a first mathematical model of fracture toughness of paper/paperboard as a function of a plurality of variables, each variable representing a respective material property of the paper/paperboard;

(b) determining a desired fracture toughness value;

(c) determining respective values for each of said plurality of variables which, when inserted in said first mathematical model, result in a fracture toughness value approximately equal to said desired fracture toughness value; and

(d) manufacturing a paper/paperboard product having respective material properties represented by respective values that are substantially equal to said determined respective values,

wherein said variables used in said first mathematical model represent filler level, softwood pulp content and caliper.

28. The method as recited in claim 27, wherein said first mathematical model of fracture toughness is of the form:

$$FT = \beta_0 - \beta_1 x_1 + \beta_2 x_2 + \beta_3 z_2$$

where x_1 is a function of filler level, x_2 is a function of softwood pulp content, z_2 is a function of caliper, and β_0 through β_3 are constants.

29. The method as recited in claim 27, further comprising the steps of:

(e) formulating a second mathematical model of stiffness of paper/paperboard as a function of a plurality of variables, each variable representing a respective material property of the paper/paperboard; and

(f) determining a stiffness value by inserting values for said variables in said second mathematical model, wherein two of said values were determined in step (c).

30. The method as recited in claim 29, wherein said variables used in said second mathematical model represent filler level, basis weight and caliper.

31. The method as recited in claim 27, further comprising the steps of:

(e) formulating a second mathematical model of internal bond of paper/paperboard as a function of a plurality of variables, each variable representing a respective material property of the paper/paperboard; and

(f) determining an internal bond value by inserting values for said variables in said second mathematical model, wherein one of said values was determined in step (c).

32. The method as recited in claim 31, wherein said variables used in said second mathematical model represent filler level, basis weight and relative humidity.

REMARKS

In the Final Rejection, the Examiner indicated that claims 16 and 24 would be allowable if suitably amended in independent form. However, during a telephone interview with